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Indian Standard

BENTONITE FOR GROUTING IN CIVIL ENGINEERING WORKS — SPECIFICATION

UDC 691·261·1 : 624·152·612·3

DESCRIPTORS : BENTONITE, GROUTING

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1989

Price Group 2

Foundation and Substructure Sectional Committee, BDC 52

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 15 March 1989, after the draft finalized by the Foundation and Substructure Sectional Committee had been approved by the Civil Engineering Division Council.

Grouting plays an important role in the control of seepage in foundations and earth structures depending on the type of structure and the nature of foundation strata. Bentonite is now extensively used as a grouting material because of its properties of swelling and thixotropy. It was, therefore, felt that a specification for bentonite used as a grouting material is needed. This specification covers bentonite which becomes permanent element of the structure and does not include applications, such as drilling mud used as constructional aid.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a measurement shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BENTONITE FOR GROUTING IN CIVIL ENGINEERING WORKS — SPECIFICATION

1 SCOPE

This standard prescribes the requirements and the methods of sampling for bentonite used as grouting material.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
2720	Methods of test for soils
Part 4 : 1986	Grain size analysis (*second revision*)
Part 5 : 1985	Determination of liquid and plastic limits (*second revision*)
Part 26 : 1987	Determination of *p*H value (*second revision*)
Part 40 : 1975	Determination of free swell index of soils
2809 : 1972	Glossary of terms and symbols relating to soil engineering (*first revision*)
4905 : 1968	Methods for random sampling.

3 TERMINOLOGY

3.0 For the purpose of this standard, the definitions of terms as laid down in IS 2809 : 1972 shall apply.

3.1 Thixotropy

It is the property of certain clays by virtue of which they regain, on standing for a short time, a part of the original strength lost due to remoulding, at unaltered moisture content.

4 GRADES

Bentonite shall be of two grades, namely, high grade (HG) which is sodium based, and low grade (LG) which is calcium based (*see* Table 1).

5 REQUIREMENTS

5.1 General

The material shall be in the form of a very fine, palebuff, grey to light grey or cream coloured powder, free from dirt and other foreign matter.

5.2 Physical and Chemical

The material, when tested according to the methods indicated in Table 1, shall comply with the requirements specified in col 3 and col 4 of Table 1.

6 PACKING

For large scale bulk supplies, the material shall be packed in closed wagons. For smaller packing, the material shall be packed in jute bags. The bags shall be in good condition at the time of inspection.

7 MARKING

7.1 The packages shall be marked legibly and indelibly with the following information:

a) Name and grade of the material;

b) Weight of the material in the package;

c) Manufacturer's name and/or his recognized trade-mark, if any;

d) Lot number to enable the batch of packing to be traced from records; and

e) The number of bags (net mass) to the tonne or approximate net mass.

7.2 The packages may also be marked with the Standard Mark.

8 SAMPLING

The method of drawing representative samples of the material from a lot, number of tests to be performed and the method of finding the criteria for conformity of the material to the requirements of this specification shall be as prescribed in Annex A.

Table 1 Requirements of Bentonite for use as Grouting Material

(*Clauses* 4.1 *and* 4.2)

Sl No.	Characteristic	Requirements for		Method of Test, Reference
		High Grade	Low Grade	
1.	*p*H	8·0 to 10·5	> 7·5	IS : 2720 (Part 26)-1987
2.	Liquid limit	> 300 %	> 100 %	IS : 2720 (Part 5)-1985
3.	Swelling by volume	10 to 12 times original volume	4 to 6 time original volume	IS : 2720 (Part 40)-1977
4.	Fineness by wet sieving and wet mechanical analysis: Cumulative percentage by weight of all particles finer than size stated under			IS : 2720 (Part 4)-1986
	0·002 mm	> 85·0	> 60·0	
	0·2 mm	> 99·9	—	
	2·0 mm	100·0	—	

ANNEX A

(*Clause* 8)

SAMPLING OF BENTONITE

A-1 GENERAL REQUIREMENTS OF SAMPLING

A-1.0 In drawing, storing, preparing and handling test samples, the following precautions shall be observed.

A-1.1 Samples shall not be taken at a place exposed to weather.

A-1.2 Precautions shall be taken to protect the samples, sampling implement and the sampling container from accidental contamination.

A-1.3 To draw a representative sample, the contents of a each container selected for sampling shall be mixed thoroughly by suitable means.

A-1.4 Each sample container shall be sealed air-tight after filling and marked with full details of sampling.

A-2 SAMPLING FROM BULK CONSIGNMENT

A-2.1 Lot

The quantity of bentonite in each individual heap or wagon shall constitute a lot. Samples shall be tested from each lot for ascertaining the conformity of the material in the lot to the requirements of this specification.

A-2.2 From each lot, about 10 kg of bentonite shall be sampled by taking not less than five increments from different portions of the consignment.

A-2.3 Wherever possible the increments are to be collected at regular intervals when the material is loaded into or unloaded from trucks or wagons. In all the cases, it is necessary to scrap off the top 10 cm to remove the contaminated layer by means of a scoop. Wherever it is not possible to collect samples during loading or unloading, increments shall be collected from the collected from the front, centre and rear of each truck or wagon from varying depth of less than 15 cm from the surface of the material.

A-2.4 Preparation of Test Samples

After collecting about 10 kg of bentonite as described in **A-2.3**, spread out the material on an even, clean and hard surface, flatten it out and scoop the mass together into a cone. Flatten the heap again and take the sample by removing two diagonally opposite quadrants with the scoop. To this collected material, add some from the middle of each of the remaining quadrants and again form the material into a cone. Repeat this process of coning and quartering till 1 kg of the material is left. This shall be called the composite sample.

A-3 SAMPLING FROM PACKAGES

A-3.1 All the packages in a sample consignment of bentonite of the same grade drawn from a single source shall constitute a lot.

A-3.2 The number of packages (n) to be selected from the lot shall depend upon the size of the lot (N) and shall be in accordance with Table 2.

Table 2 Number of Packages to be Selected for Sampling

Lot Size N	No. of Packages to be Selected n
(1)	(2)
Up to 25	3
26 to 50	4
51 to 100	5
101 to 200	6
200 and above	8

A-3.3 These packages shall be selected at random from the lot and in order to ensure the randomness of selection, random number tables shall be used (*see* IS 4905 : 1968). In case such tables are not available the following procedure may be adopted:

Starting from any package, count the packages in one order as 1, 2, 3 .... upto r and so on where r is the integral part of N/n (N and n being the lot size and sample size, respectively). Every rth package thus counted shall be withdrawn to form the sample.

A-3.4 Preparation of Test Samples

A-3.4.1 From each of the package selected according to **A-3.3**, a portion of the material, about 400 g, shall be drawn with the help of a sampling implement.

A-3.4.2 Out of the portions from each package, equal quantities of bentonite shall be taken and mixed thoroughly to form a composite sample of about 1 kg. This composite sample shall be divided into three equal parts, one for the purchaser, another for the supplier and the third for reference. These three parts shall be kept in separate containers which shall then be closed and labelled with full identification and particulars.

A-4 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-4.1 These for the determination of all the characteristics given in **5** shall be calculated on the composite sample.

A-4.2 The lot shall be considered as conforming to the specification if all the test results satisfy the corresponding requirements given in Table 1.

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